

# APPLICATION OF LEAN MANUFACTURING IN THE PAINTING PLANT MANUFACTURING PROCESS BY REDUCING WASTE WAITING A CASE STUDY AT PT.KOBA MULTI INDONESIA

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## ABSTRACT

*PT. Koba Multi Indonesia is a local private company engaged in Manufacturing (Fabrication and Services), to be able to maximize production that continues to grow in accordance with its era and increase profits to the company by trying to reduce costs, improve quality and timely delivery to customers. This study, aims to determine the various forms of waste that often occur at PT. Koba Multi Indonesia, so that it can increase production efficiency, therefore we need a lean manufacturing approach. Lean Manufacturing is an effort to eliminate waste in production, increase added value on a product and provide continuously improved value to customers by a manufacturing industry, by using the value stream mapping method to improve efficiency. Lean manufacturing methods focus on identifying and eliminating activities that have no added value, the first step is the translation of the VSM method (value stream mapping) as a tool for mapping the entire production process, then weighing 7 wastes through a questionnaire and the results of ranking waste translated through the RCA method (root cause analysis). So that, this research can increase productivity and know activities that do not add value (Non Value Added) in line with the process of making painting plants and eliminating waste as one of the causes of delay in making a painting plant in the completion of job handover.*

**KEYWORDS:** Lean Manufacturing, VSM, RCA, Root Cause Analysis & Value Stream Mapping

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## INTRODUCTION

In an era of free market, or commonly called the era of globalization, he is often echoed by economic observers over the last decades. The industrial world is increasingly being demanded to be more competitive, competing with other companies, one of which is to improve the quality of service to consumers, this can be achieved by providing quality production expected by consumers to deliver on-time goods. This also applies to manufacturing industry like our company (PT Koba Multi Indonesia)

Line Drawing is a drawing system integrated with modern systems for industrial goods that produce satisfactory quality and quantity of production. Gradually, this painting system consists of Spray Booth room, which is a dust-free painting space, with controlled air and moisture control that produces perfect paint color. This room can be set at certain temperatures according to paint specifications.

PT. Koba Multi Indonesia is a company which is a Work Order, in which our company works on Line drawings or other work at customer's request, usually in tenders to get a job. So, the production process and other

activities are done in such a way that the projects that run can produce more effective and efficient. To meet customer requirements, the company will carry out Value Delivery. But the implementation of Value Delivery is not always smooth, it is one of the West for the company. For this reason, researchers are attempting to study this study to develop a company that can now grow over time with increasingly changing years.

The data taken for the problem of this study often occur in PT. Koba Multi Indonesia has no optimum shielding in production (Fabrication and Installation), so it interferes with the production process of making the Drawing Path affecting the return of the delivery time as agreed at the commencement of the contract. In this discussion, I tried to make a Lean Milling approach with the Stream Value Mapping Method, focusing on quantity control to reduce costs by eliminating the West, paying attention to product quality, integrity, sustainability, and consistency as a corporate culture.

The introduction of waste in the manufacturing process of painting plant in PT. Koba Multi Indonesia uses a lean manufacturing approach, using the Stream Value Mapping method to map the flow of value in detail by minimizing residuals, so root analysis is made to determine the root problem of residual defect. The drawing process itself is performed by several sub-divisions of the work process comprising several stages, namely purchase / warehouse, pre-fabricated engineering (sheet metal / cutting bending process), fabrication, installation / installation, and accreditation testing. In the above stages, researchers try to deepen the waste problem, because of the amount of waste that occurs in the above-mentioned process subdivision. Based on data obtained by researchers, data on postponement in cropping during the period of 2015 to 2017 is still high enough. As can be seen in table 1

**Table 1: Data on Project Delays from 2015 to 2017**

No	Period	Number of Projects	Late	Achieved
1	2015	14	9	64%
2	2016	13	8	62%
3	2017	11	6	55%
Total		38	23	61%

From the table above, it can be explained that the number of delays in project completion is still high, the importance of completing the project is a priority, researchers will look for what is causing delays in making painting drawings.

## STUDY LITERATURE

### Lean Manufacturing Concept

Lean is a continuous effort to eliminate waste and increase product value added (goods / services) to provide value to customers (customer value). The APICS Dictionary (2005), defines Lean as a business philosophy by minimizing the use of resources (including time) in various company activities. Lean focuses on identifying and eliminating value-added activities in design, production (for manufacturing) or operations (for services), and supply chain management, directly related to customers (Gaspersz, 2011).

Lean is applied to the entire company called a lean company. The lean used for manufacturing is called lean manufacturing, and the lean used in the services sector is called lean, lean services used for banks called lean banking, leaning on retail is called lean retail, lean in government is called a slim government and others others (Gaspersz, 2011).

There are five lean principles:

- Identify product value based on customer's perspective.
- Identify value flow mapping for each product.
- Eliminate unnecessary additional waste from all activities along the value stream.
- Organize materials, information, and products to flow smoothly and efficiently during the flow value process using the pull system.
- Continuous search for improvements in equipment and techniques to achieve excellence and continuous improvement. Marine refinement can be defined as an approach to identify and eliminate wastes or activities that have no added value added value) through continuous radical increase (continuous radical increase) through product flow (material, work processes, outputs) and information using internal customer pull systems and exterior to pursue excellence and perfection (Gaspersz, 2011).

### **Concept of Basic Waste**

Waste can be defined as all work activities that do not provide added value in the process of converting inputs to output along the flow path mapping. Based on the thinner perspective, all types of garbage contained throughout the process of value flow that convert input to output should be eliminated to increase the value of the product (goods or services) and then increase customer value (Vincent and Avanti, 2011) According to Gaspersz (2011) "Seven Plus One Type of Waste" contained in the production system, namely:

#### **Over Production**

Over production is the worst type of waste that affects the other six types of waste. Over production occurs because producing a product exceeds customer needs which results in a buildup of products that require transportation, storage, inspection, and possible disability. In addition, over production occurs because of variations in products produced by the company.

#### **Waiting Time (Delay)**

Waiting time is caused because it is not balanced with production, so that delays can be seen through people waiting for machines, equipment and raw materials.

#### **Transportation**

Transportation is a waste in the form of movement around the production floor. Transportation occurs between the steps of the manufacturing process, processing flow and shipping to customers.

#### **Over processing**

Waste in the process is caused by excessive processes that are not desired by the customer. The company makes product specifications outside the customer's wishes so that it often creates waste in production.

## **Motion**

Motion is a type of waste caused by movements that are not needed by an operator or mechanic such as walking, looking for tools or materials. This is said to be waste when you see an operator who is actively moving and looks busy, so he often makes unnecessary moves.

## **Inventory**

Inventory is a type of classic waste, all inventory includes waste unless translated directly for sales. Inventory can be in the form of raw materials, work in process or finished goods.

## **Defect Product**

This type of drilling can be called scrap, which is caused by consumer dissatisfaction with the product being returned to the company besides the process that is not good.

## **Defective Design**

Waste caused by design work that does not meet customer needs as well as adding unnecessary features. Basically there are two main categories of waste, namely Type One Waste and Type Two Waste (Vincent and Avanti, 2011).

Type one waste is a work activity that does not create added value in the process of transforming inputs into output throughout the value stream, but this activity cannot be avoided at present for various reasons. For example, inspection and sorting activities from the Lean perspective are non-value-added activities so that it is waste, but at the moment we still need inspection and sorting because the machines and equipment used are old so the level of reliability is lacking. Similarly, supervision of people, for example, is a non-value-added activity based on a lean perspective, but at the moment we still have to do it, because the person has just been recruited by the company so that he is not experienced. In this context, inspection, sorting, and supervision activities categorized as Type One Waste must be eliminated or reduced. Type One Waste is often referred to as Incidental Activity or Incidental Work which is included in non-value-adding-work or activity

Type Two Waste is an activity that does not create added value and can be eliminated immediately. For example, produce a defect product or make an error that must be removed immediately. TypeTwo Waste is often called waste only, because it really is a waste that must be identified and eliminated immediately. The concept of value added activity, incidental (non value added) activity or type one waste, and type two waste (waste) can be seen in the following chart (Vincent and Avanti, 2011):

## **VSM (Value Stream Mapping )**

Keyte and Locher (2004) explain that the achievement of VSM, which has traditionally used traditional manufacturing arrangements, can be applied to service arrangements, including administrative processes. In the Service setting, determining the current or future conditions of the value stream for a specific process can be done by:

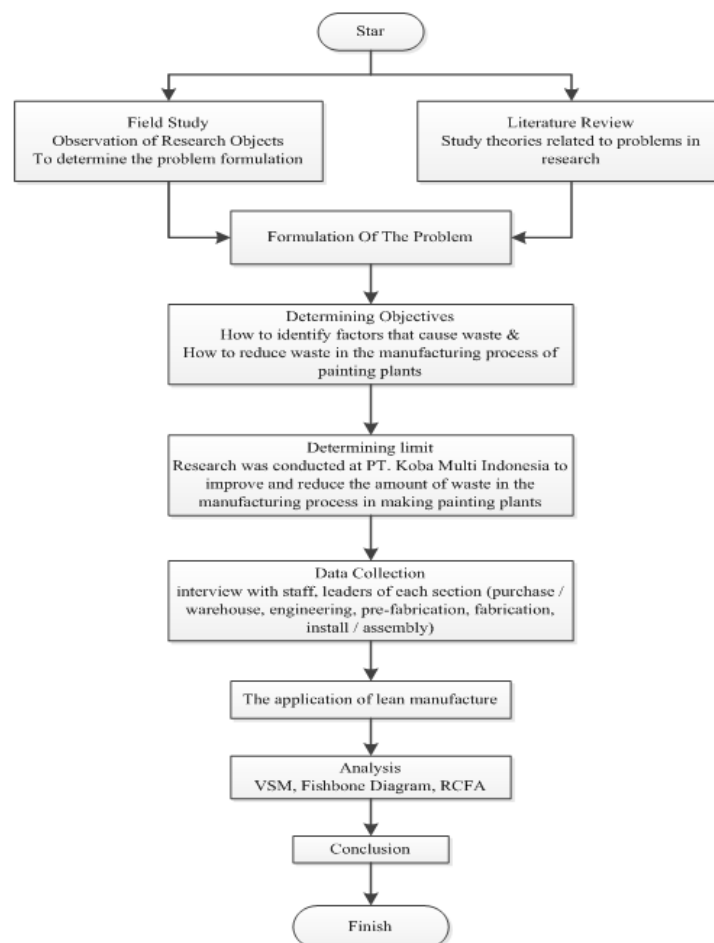
- Determine the starting point and end point of a process.
- Get to know all stakeholders.

- Know which metric is used to represent the value of the entire process
- Make a flow chart to find out all the previous steps and successively toward specific steps.
- Measure the metric in point 3 regarding the amount of use and waste when working.
- Identify opportunities for improvement
- Identify corrective actions to show opportunities for improvement.

Value Stream Mapping (VSM) checks the added value of each step in the supply chain process. The difference between Value Stream Mapping (VSM), flowchart and blue mapping (blueprinting) is that VSM tries to highlight value-added activities and that are not of added value, only that, the economic side of the flow diagram. Value Stream Mapping (VSM) is a principle that is essentially the same as basic flowchart, the difference is that VSM finds and maps activities that have added value (value added work) and activities that have no added value (non- value added work). Directly VSM contributes profits to the company by reducing non-value added work.

## METODOLOGY

In research, a structured method is needed, in which there are certain steps and rules to get a research result correctly. The research methods in this study are as follows:



**Figure 1: Research Method**

## ANALYSIS AND RESULTS

### Analysis of Value Stream Mapping - Current State Map

Value stream mapping is a tool that is used to describe a system as a whole that is contained in a company, so that it is known the flow of information and the physical system and the processing time in each sub-section needed. The total actual processing time for the painting plant production reaches 189 days, the effort to reduce the total process is the main concern of this study. Besides knowing the process, it also knows the potential of waste in the whole process.

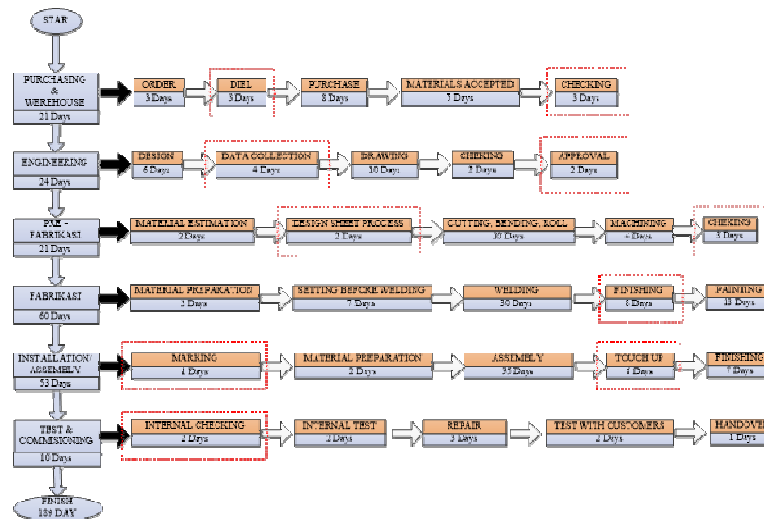


Figure 2: Current State Mapping Process of Making a Painting Plant

### Identification of Seven Waste Analysis

Untuk menganalisa dan indentifikasi pemborosan peneliti memberikan pertanyaan kepada pelaku produksi yang terkait dalam produksi painting plant. Wawancara dilakukan secara langsung kepala seluruh pimpinan sub-bagian proses, manager, supervisor, dan karyawan pelaksana yang terkait pada produksi painting plant. Dari hasil pembobotan tujuh waste dapat diketahui terdapat tiga jenis pemborosan yang paling dominan dan memiliki skor rata-rata paling besar sebagai berikut.

- Waiting (menunggu) dengan score sebesar 8,6 (25%).
- Over processing (proses yang tidak tepat) dengan score sebesar 8,4 (24%).

Sebagaimana dilihat pada tabel 2.

No	Waste	Score	Percentage	Rank
1	Over Production	2,8	8%	7
2	Defect	3,2	9%	6
3	Inventory	3,9	11%	4
4	Over Processing	8,4	24%	2
5	Transportation	4,6	13%	3
6	Waiting	8,6	25%	1
7	Motion	3,5	10%	5

Table 2: Average Score of Waste in the Manufacturing Process Painting Plant

### Cause Analysis – Fishbone Diagram

One tool in finding the root cause of the problem is root cause analysis, used to identify the details of all possible causes of the problem described through elements: material, man, machine, and method. In the solution and input of fishbone diagrams, solutions are extracted from interviews with managerial parties, PT. Koba Multi Indonesia includes: Manager of Purchasing / Warehouse Sub Division, Engineering, Pre-Fabrication, Fabrication

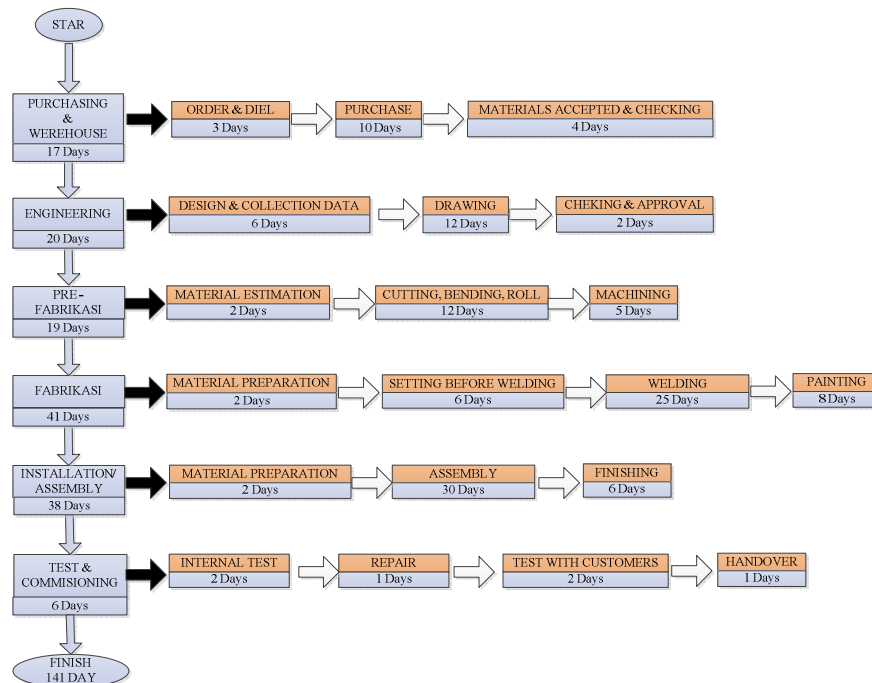
**Table 3: Results of Translation Fishbone Diagram and Improvement Recommendations**

Waste	Point	Cause	Improvement
Waiting	Material	Late purchase process	Accelerated and active in ordering material
		Material received is not standard	Improve Commitments with suppliers
		Less careful when receiving goods	Do a careful check on the items that come
	Machine	Limited number of engines	Investment new machines and subcontracts to other parties
		Waiting for machine setup	For a standard operational machine
		Broken machine	Replacement parts to maintain engine precision
	Man	Limitations of skilled human resources	Recruit skilled human resources and conduct training regularly
		Error in work process	the role of supervisors in monitoring operational standard procedures
	method	Material treatment	for standard operating procedures for material treatment
		The process between the old sub-sections	Time discipline in each process
		Do not have standard operating procedures	Refers to international standards, such as: SNI, JIS
Over Process	Material	error in choosing material	Regular training in recognizing material
	Machine	Error in machine setup	The need for a supervisory role oversees and checks in the machine set-up
		Machines that are old and often damaged	Invest a new machine to repair a damaged engine to make it better
	Man	Lack of skilled human resources	There is training or certification for young personnel competencies
		Lack of technology transfer	The need for increased competence
	Method	Incorrect storage	Arrangement of inventory according to standard material requirements
		Incorrect process	The need for standard operating procedures for the process

Install / Assembly, & Commissioning Test, which relates to technical matters, the factors that delay the production process are making a painting plant. From the analysis of fishbone diagram, recommendations can be drawn for improvements to eliminate waste production, among others, can be seen in table.

### Perancangan Value Stream Mapping Future State Map

Melalui hasil identifikasi waste pada awal kondisi current map maka dibutuhkan rancangan mapping baru, yaitu mengeliminasi sebagai berikut :



**Figure 3: Future State Mapping Process of Making a Painting Plant**

- Eliminate too long waiting time in fabrication and installation / assembly sub-sections by combining several stages of the workmanship to be adjusted to the time required 41 days in the fabrication sub-section and 38 days in the installation / assembly sub-section, while the time available is too over 60 days in the fabrication sub-section and 53 days in the installation / assembly sub-section, as a whole the manufacturing time for painting plants in all stages is 189 days while the supposed time is 141 days, the remaining 48 days are wasteful activities that are not add value to the company at the painting plant production. This is based on technical identification information with the process technology PT. Koba Multi Indonesia.
- Waste That Happens That Leads to Project Delay, From the entire sub-part work process that takes place in production, things from observations state that more activities do not provide benefits or a lot of time is wasted. Therefore, the data from the findings obtained above shows that activities that do not provide added value have an impact on the length of the work process in each sub-section, so that the company's targets cannot be achieved.
- Based on observational data in the future state, there are differences in the amount of time and time reduction in each sub-section of the work process. Apart from providing solutions and problem solving in the table above, it is also supported by eliminating / reducing waste, including the absence of errors in checking items, errors in design, fabrication and installation / assembly, thereby reducing the workload on work processes in all sub part.

## CONCLUSIONS

Based on the analysis of the results that have been done at PT. Koba Multi Indonesia in the application of lean manufacturing in the design of painting plants to overcome project delays, the conclusions are as follows:

- The type of waste that occurs in the work process of each sub-section in PT. Koba Multi Indonesia, from all processes there is a long waiting time and lack of manpower and adequate equipment.



- There is a delay in the work process of all sub-sections, from the standard time that has been determined.
- To optimize every existing production process so as to minimize any waste that occurs, the authors suggest that the company continue to improve the quality of work and continuous improvement and clear SOPs for each employee so that the work becomes more focused and can be continuously controlled so that existing waste can be minimized

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